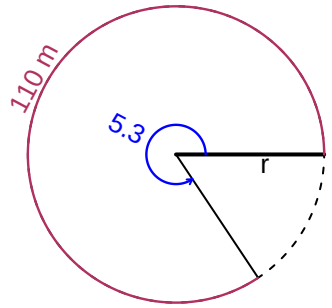
Name: Date:

Trig Final (Solution v3)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.3 radians. The arc length is 110 meters. How long is the radius in meters?

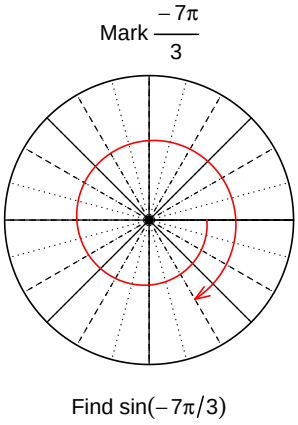


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

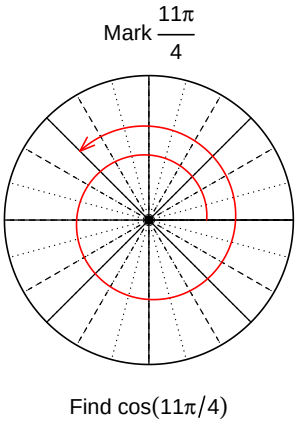
$r = 20.75$ meters.

Question 2

Consider angles $\frac{-7\pi}{3}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-7\pi}{3}\right)$ and $\cos\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-7\pi/3)$



Find $\cos(11\pi/4)$

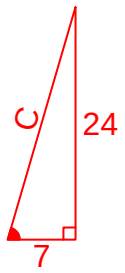
$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-24}{7}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

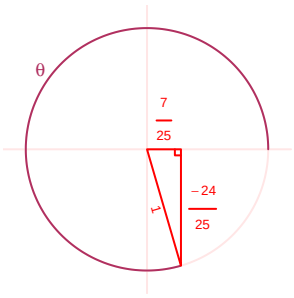
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + 24^2 = C^2$$
$$C = \sqrt{7^2 + 24^2}$$
$$C = 25$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{7}{25}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.57 Hz, an amplitude of 2.04 meters, and a midline at $y = 7.44$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.04\cos(2\pi 3.57t) + 7.44$$

or

$$y = -2.04\cos(7.14\pi t) + 7.44$$

or

$$y = -2.04\cos(22.43t) + 7.44$$